Remarks

1. Summary of Office Action

In the office action dated March 1, 2004, the Examiner rejected claims 1, 9, 20, 26, 27, and 33 under 35 U.S.C. § 103(a) as being unpatentable over Dong *et al.*, U.S. Patent No. 6,343,101 ("Dong"). The Examiner also rejected claims 12, 13, 15, and 16 under 35 U.S.C. § 103(a) as being obvious over a combination of Dong and Norrell *et al.*, U.S. Patent No. 6,084,883 ("Norrell"). Additionally, the Examiner indicated that claims 2-8, 10, 11, 21-25, and 28-32 would be allowable if rewritten to overcome rejections under 35 U.S.C. 112 second paragraph and to include all limitations of the base claim and all intervening claims.

2. Response to 35 U.S.C. § 103(a) Rejection Under Dong

Claims 1, 9, 20, 26, 27 and 33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Dong.

Dong is directed to a pulse coded modulation modem that performs a frame based spectral shaping method (Col. 3 lines 48-50). A metric computation mechanism measures the spectral shaping performance of different types of possible frames (Col. 3 lines 54-55). Based on the metric computation a decision mechanism selects the best frame to optimize the spectral shaping (Col. 3 lines 56-58). As part of the modem operation, groups of 40 user data bits are accepted for each frame (Col. 7 lines 28-30). The 40 data bits are turned into six symbols where each symbol has a magnitude and a sign bit (Col. 7 lines 33-49). Hence each frame contains six magnitudes and six sign bits. Two types of frames are then created. A first type has the magnitude and sign bits determined by the data bits and the second type, the inversion, has half the sign bits flipped (Col. 7 lines 56-60; Col. 8 lines 2-7). An inversion decision mechanism

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makes the decision of whether these selected sign bits will be inverted before transmission (col. 10 lines 33-44). After transmission, if the inversion frame was sent then an inversion is performed (Col. 11 lines 21-24).

Dong mentions that differential encoding can be done to limit error propagation (Col. 5 lines 65-67; Col. 11 lines 54-67). According to Dong differential encoding of the sign bits can exist without doing the decoder any harm (Col. 11 line 66-Col. 12 line 1). However, no details of the differential encoding methods that may be performed are discussed in Dong.

Claim 1 of the pending application is directed to a method for compensating for channel inversions comprising, *inter alia*, the steps of determining a sign of a frame; differentially encoding the sign of the frame; differentially encoding the frame by selectively inverting the frame in response to the differentially encoded sign of the frame, adding the selectively inverted frame to a prior encoded frame, and performing a modulo N reduction; and transmitting a channel output comprising the differentially encoded frame. Claim 1 has been amended to clarify the step of differentially encoding the frame so that the step uses the differentially encoded sign of the frame to selectively invert the frame and add to a prior inverted frame. Hence claim 1 speaks of doing two separate steps of differential encoding: differentially encoding a sign of a frame and differentially encoding the frame. As discussed above, Dong does mention differential encoding. But since Dong gives no details of how differential encoding is done, Dong does not teach or suggest doing two steps of differential encoding as set forth in claim 1. For at least this reason claim 1 is not obvious in light of Dong and therefore should be allowed.

Claim 1 also includes the step of determining a sign of a frame. As discussed above, Dong does mention sign bits and the flipping of selected sign bits based on an inversion-decision

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mechanism. However, the sign bits of Dong are sign bits corresponding to the multiple symbols contained within a frame (Col. 7 lines 33-49). Certain of these sign bits may be inverted depending on the inversion decision (Col. 7 lines 58-60; Col. 10 lines 34-38; Col. 10 line 65 to Col. 11 line 2). Hence these sign bits are not a sign of a frame as in claim 1. Therefore, for at least this reason claim 1 is not obvious in light of Dong.

Summarizing briefly, claim 9 is directed to a method of compensating for a phase shift in a modem comprising the steps of attributing a sign to a frame of constellation points, differentially encoding the frame, and differentially decoding the frame. Claim 9 has been amended to clarify that the frame encoding step involves selectively inverting the frame in response to a differentially encoded sign of the frame, adding the selectively inverted frame to a prior encoded frame, and performing a modulo N reduction.

As discussed above Dong does discuss sign bits. However, the sign bits of Dong are sign bits corresponding to the multiple symbols contained within a frame (Col. 7 lines 33-49). Hence Dong does not teach or suggest attributing a sign to a frame of constellation points. Dong can therefore not teach or suggest differentially encoding a frame by selectively inverting the frame in response to such a sign of the frame that has been differentially encoded. For at least this reason claim 9 is allowable.

As discussed above with regard to claim 1, while Dong does mention differential coding, Dong gives no details on how differential coding is done. Hence Dong does not teach of differentially encoding the frame by selectively inverting the frame in response to a differentially encoded sign of the frame, adding the selectively inverted frame to a prior encoded frame, and performing a modulo N reduction as is included in claim 9. Dong also does not teach of differentially decoding the frame by (i) selectively inverting the differentially encoded frame (ii)

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adding the selectively inverted frame to the modulus N, and (iii) performing a modulo N reduction as is included in claim 9. Hence for at least these additional reasons claim 9 should be allowed.

Claim 20 is directed to a method of using differential encoding for communication comprising the steps of, *inter alia*, determining a sign of a frame, differentially encoding the sign of the frame, and differentially encoding a first encoded frame so as to produce a second encoded frame. As discussed above with regard to claim 1, Dong does not teach or suggest performing two steps of differentially encoding or of determining a sign of a frame as included in the method of claim 20. Hence for at least these reasons claim 20 should be allowed.

Claim 20 also includes the step of applying the differentially encoded sign to the frame. As discussed above, Dong does teach of a frame made up of a number of symbols that includes multiple sign bits. Dong also mentions the idea of doing differential encoding. However, Dong does not teach or suggest applying a differentially encoded sign to the frame. Therefore, for at least this reason claim 20 should be allowed.

Claim 26 depends from independent claim 20 which is allowable. For at least this reason claim 26 is also allowable.

Claim 27 is directed to a method of differentially encoding a communication including the step, *inter alia*, of receiving a channel output comprising a first encoded frame wherein the first encoded frame comprises a differentially encoded second-encoded frame and wherein the second-encoded frame comprises a differentially encoded sign of a frame applied to such a frame. As discussed above, Dong does not teach or suggest applying a sign to a frame so Dong does not teach or suggest receiving such a first encoded frame. Claim 27 also contains the steps, *inter alia*, of differentially decoding a sign of the channel output and differentially decoding the

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channel output so as to obtain a frame. While Dong does mention differential encoding, Dong does not teach or suggest performing two differential decoding steps as in claim 27. For at least these reasons claim 27 should be allowed.

Claim 33 adds to the method of claim 27 the step of translating the differentially encoded frame into symbols. Claim 27 is dependant on independent claim 27 which has been shown to be allowable. For at least this reason claim 33 should also be allowable.

3. Response to 35 U.S.C. § 103(a) Rejection Under Dong in view of Norrell

The Examiner rejected claims 12, 13, 15, and 16 under 35 U.S.C. § 103(a) as unpatentable under Dong in view of Norrell.

Norrell is directed to a method of encoding data that uses a multiple modulus M-ary signal for efficient data transmission (Abstract). Norrell does teach using 16-bit numbers that include sign bits (Col. 4 lines 21-22). Norrell does not teach or suggest using differential encoding.

Claim 12 adds to the method of claim 9 that the differential decoding is performed after being supplied to a multiple modulus decoder. Because claim 12 is dependent on claim 9, claim 12 contains the steps of, summarizing briefly, attributing a sign to a frame of constellation points, differentially encoding the frame, and differentially decoding the frame. While Norrell teaches of using 16-bit numbers that have sign bits, Norrell does not teach or suggest attributing a sign to a frame of constellation points. As discussed above, Dong also does not teach or suggest attributing a sign to a frame of constellation points. Hence the combination of Norrell and Dong can not teach or suggest attributing a sign to a frame of constellation points. For at least this reason claim 12 should be allowed.

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As discussed with regard to claim 9, Dong does not teach or suggest performing the steps of differentially encoding the frame and differentially decoding the frame in the manner as is done in claim 9. As discussed above, Norrell does not teach or suggest performing differential encoding. Hence the combination of Norrell and Dong can not teach or suggest differentially encoding the frame by selectively inverting the frame in response to a differentially encoded sign of the frame, adding the selectively inverted frame to a prior encoded frame, and performing a modulo N reduction as is included in claim 12. Also, the combination of Norrell and Dong can not teach or suggest differentially decoding the frame by (i) selectively inverting the differentially encoded frame (ii) adding the selectively inverted frame to the modulus N, and (iii) performing a modulo N reduction as is included in claim 12. For at least these reasons claim 12 should be allowed.

Claim 13 adds to the method of claim 9 that the frame is differentially encoded before being supplied to a multiple modulus encoder. Claim 13 should be allowed for the same reasons that claim 12 should be allowed.

Claim 15 adds to the method of claim 1 that the differential encoding is performed after being supplied to a multiple modulus decoder. Because claim 15 is dependent on claim 1, claim 15 contains the steps, summarizing briefly, of determining a sign of a frame of constellation points, differentially encoding the sign, and differentially encoding the frame. While Norrell teaches of using 16-bit numbers that have sign bits, Norrell does not teach or suggest determining a sign of a frame. Norrell also does not teach or suggest using differential encoding so can not teach or suggest differentially encoding the sign of the frame or differentially encoding the frame. As discussed above, Dong also does not teach or suggest determining a sign of a frame or performing two steps of differential encoding. Hence the combination of Norrell

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and Dong can not teach or suggest attributing a sign to a frame or of differentially encoding the sign of the frame and differentially encoding the frame as is done in claim 15. For at least these reasons claim 15 should be allowed.

Claim 16 adds to the method of claim 1 that the frame is differentially encoded before being supplied to a multiple modulus encoder. Claim 16 should be allowed for the same reasons that claim 15 should be allowed.

4. Allowable Subject Matter

Applicant wishes to thank the Examiner for the notice that claims 2-8, 10, 11, 21-25, and 28-32 would be allowed if rewritten to overcome the rejections under 35 U.S.C. 112 second paragraph and to include all limitations of the base claim and intervening claims. All of the previous rejections under 35 U.S.C. 112 second paragraph were withdrawn (Office Action page 2). Furthermore, as discussed above Applicant believes that all claims are currently in condition for allowance so no claim amendments will be made at this time.

5. Extension of Time

Applicant hereby petitions for a one month extension of time to reply to the Office Action. A check for the appropriate fee of $110.00 has been sent with this response.

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6. Conclusion

For the reasons set forth above, Applicant submits that claims 1-13, 15-16, and 20-33 are in condition for allowance. Therefore, Applicant respectfully requests favorable reconsideration and allowance.

Respectfully submitted,

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